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Stability of a liquid jet in a weak crossflow GHOBAD AMINI, MEHDI JADIDI, ALI DOLATABADI, Concordia Univwersity — The atomization of liquid jets in crossflow is a critical process in numerous engineering systems including fuel injection and thermal spray. In an effort to elucidate the primary breakup step, a theoretical model for three-dimensional linear stability of a viscous liquid jet injected in a weak gaseous cross flow is developed. Focusing on the early stages of the jet evolution, the problem is formulated for an oblique incidence of gas flow to the liquid jet. In the context of Kelvin-Helmholtz and Rayleigh-Taylor instabilities, a characteristic equation accounting for the growth of columnar and azimuthal waves is obtained and the most dominant wavelength and the corresponding growth rates are calculated. Symmetric and asymmetric modes of liquid jet disturbance are investigated for a wide range of viscous, surface tension, and aerodynamic force ratios. The predicted results for asymptotic cases of coflow and crossflow are examined against the experimental observations available in the literature.

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